SC0301-366

DESIGN, DEVELOPMENT AND DELIVERY OF ONE (1) BREADBOARD AND THREE (3) PRODUCTION UNITS OF A 75 VA INTEGRATED STATIC INVERTER

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TECHNICAL DISCUSSION

A. Progress Report for Month of February, 1966

1. Summary

Variable duty cycle one-shot masks were received from photo shop.

Temperature tests were performed on the complete breadboard. Some additional circuit modifications will be necessary to improve circuit operation at the temperature extremes.

Several types of inductor potting compound are under consideration.

The power transformers were reduced in size by using the next smaller core and wire size.

Initial material was processed and tested on the ÷ 10, ÷ 12, and Ripple counter arrays. A modification to the interconnection mask was required in order to assure high temperature operation. The first lot of new material (incorporating this change) is under test. Additional lots of this material are in process. Oxide removal masks for the Johnson counter array have been received, and are being checked for alignment. The contact and metallization masks for the Johnson counter are being processed. A satisfactory method of alloying the silicon chip to the header has been achieved.

Fabrication of power devices is proceeding on a limited scale until the ceramic piece parts are delivered.

2. Progress Report on Subsections

a. Preliminary Breadboard

The breadboard as it now exists is shown in Figures 1A and 1B.

Masks for the variable duty cycle one-shot were received from the photo shop and are in the process of having gold lead pattern put on now.

Temperature tests were performed on the complete breadboard. Problems were experienced with the breadboard Johnson counter malfunctioning at high temperature and heavy loads. But it is felt that longer wires required when placing the system in the oven as well as the fact that the Johnson counter is still in a discrete form account for the apparent sensitivity to system generated noise. The Johnson counter was placed outside the oven for the rest of the temperature testing. At high temperature the system regulated well but the output voltage was approximately a volt low while at low temperatures it was approximately a volt high. Also at high temperatures and a no load condition a low frequency, low amplitude oscillation could be observed on the output. At low temperatures the output appeared to be modulated by low frequency "noise". Modifications are under way now to improve the performance at these temperature extremes.

The two types of potting compounds for inductors which are under consideration are both Emerson Cumings products, (Stycast 1090 and Stycast 2850-GT both of which use catalyst 11). Thermal tests will be performed to determine which is more suitable for our application.

The power transformers have been changed since last month's report. Those presently used (See Figure 1A) use the next size smaller core and wire and operate at a slightly higher flux density than the transformer reported on last month. Performance has been satisfactory under all tests performed.

b. Flip-Flop Arrays

Material has been processed on the ÷ 10, ÷ 12, and Ripple counters. A modification was introduced to the intercon-

nection pattern. New material is presently being probed, with additional lots in process. The Johnson counter masks are being checked for alignment, and material is ready to start processing when these masks are verified. A computer program for automatic masks cutting is being utilized on the contact and metallization masks, due to their great complexity. This work is proceeding quite satisfactorily, and no delay in material is expected at this time due to these masks.

An alloying technique has been developed for mounting the bars on the header, and has proved to be quite satisfactory. Static test equipment for array testing has been checked out, and operates correctly.

c. Power Transistors

Experimental dual darlington runs have experienced a low yield because of inadequate wire welding. A subsequent run of single darlingtons had a fabrication yield of 97%, indicating that a different bonding technique eliminates the difficulty. An additional run of dual darlingtons is underway for verification. All of the slices with isolation for the single-chip approach have been metallized and are being probed. Vendors have promised delivery of properly metallized ceramic by the middle of March.

B. Current Problems and Corrective Action

None

C. Work to be Performed During Next Reporting Period

1. System

a. Continue modification to improve performance at temperature extremes.

b. Probe slices and test packaged units of variable duty cycle one-shot.

c. Work on mechanical layout of system.

2. Flip-Flop Arrays

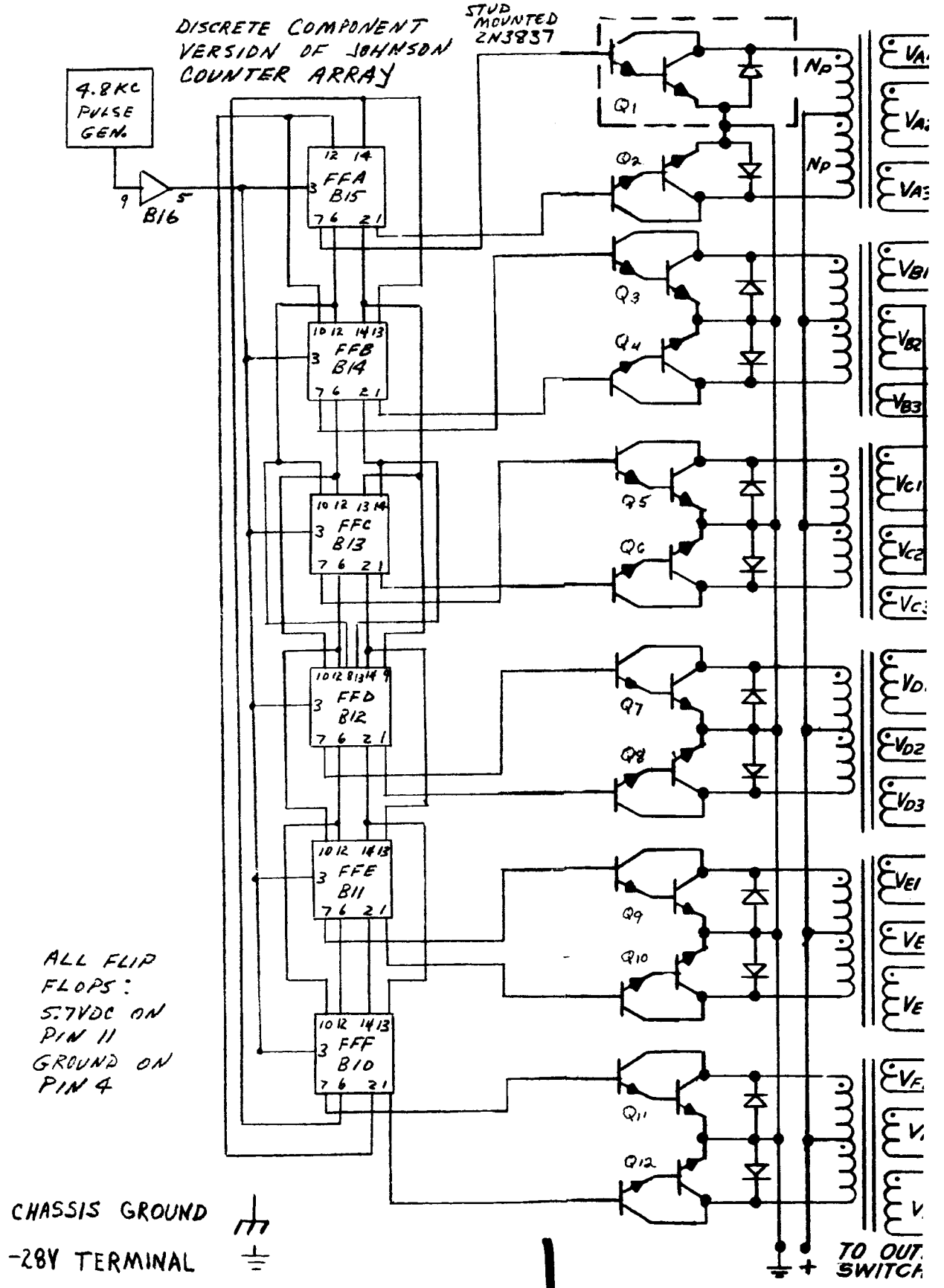
a. Process material on all arrays.

b. Assemble and test arrays.

c. Deliver devices for breadboard system.

3. Power Transistors

Fabrication of the initial dual darlingtons and complementary transistors on properly metallized ceramic should be completed.


DISCRETE COMPONENT VERSION OF JOHNSON COUNTER ARRAY
STUD MOUNTED 2N3837
4.8KC PULSE GEN.
B16
FFA B15
FFB B14
FFC B13
FFD B12
FFE B11
FFF B10
Q1
Q2
Q3
Q4
Q5
Q6
Q7
Q8
Q9
Q10
Q11
Q12
Np
Np
ALL FLIP FLOPS: 5.7VDC ON PIN 11 GROUND ON PIN 4
CHASSIS GROUND
-28V TERMINAL
TO OUT SWITCH

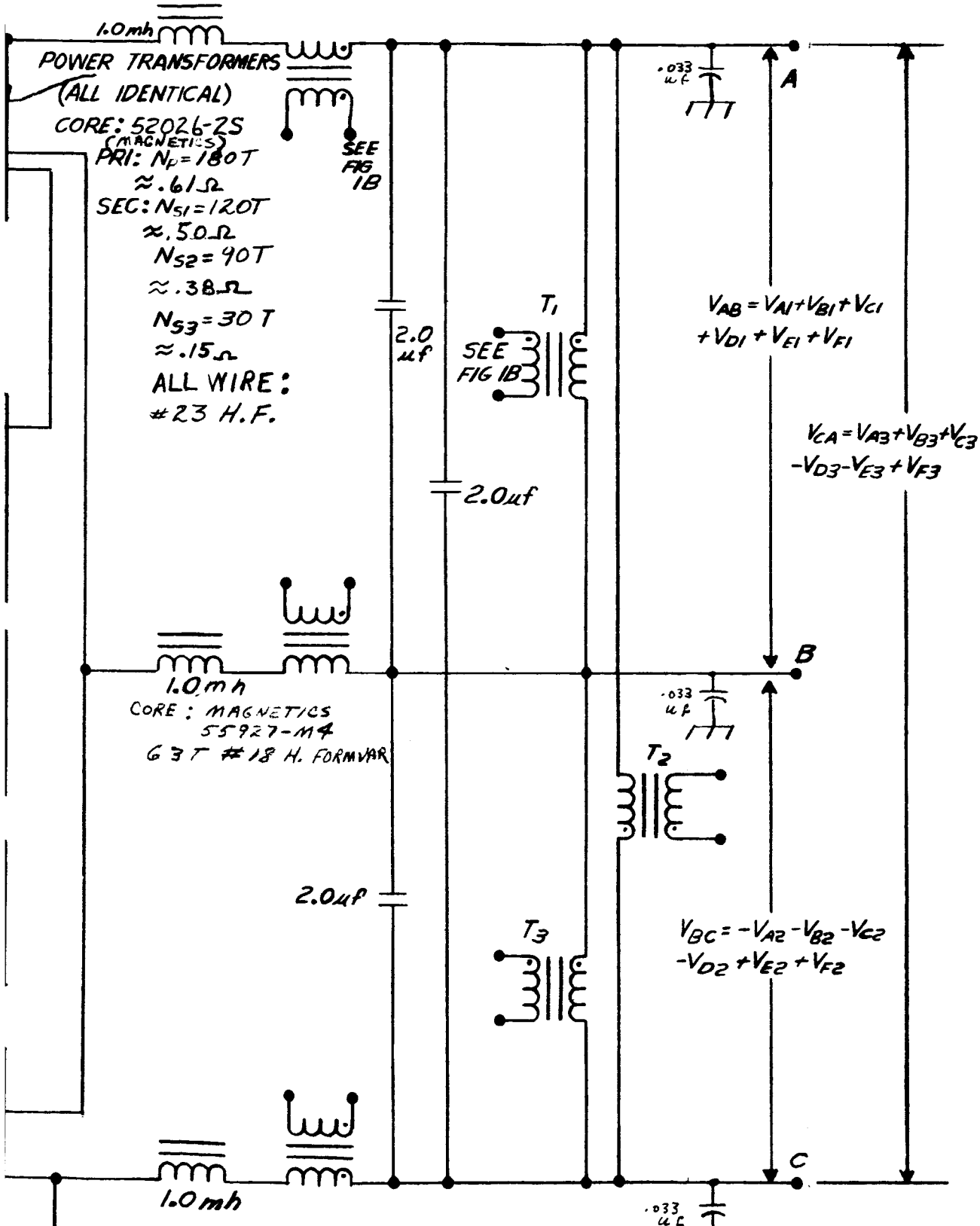


FIGURE 1A

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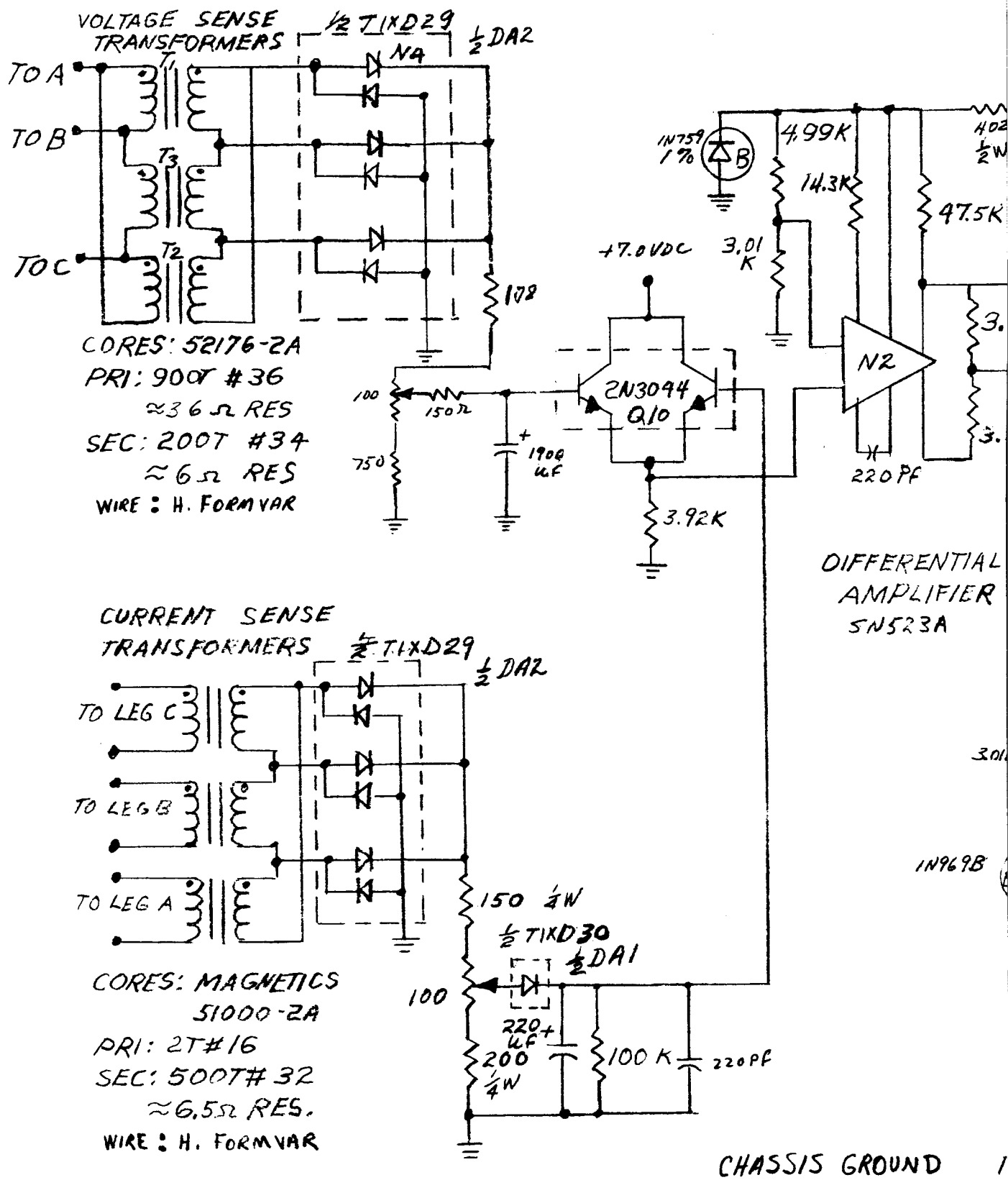
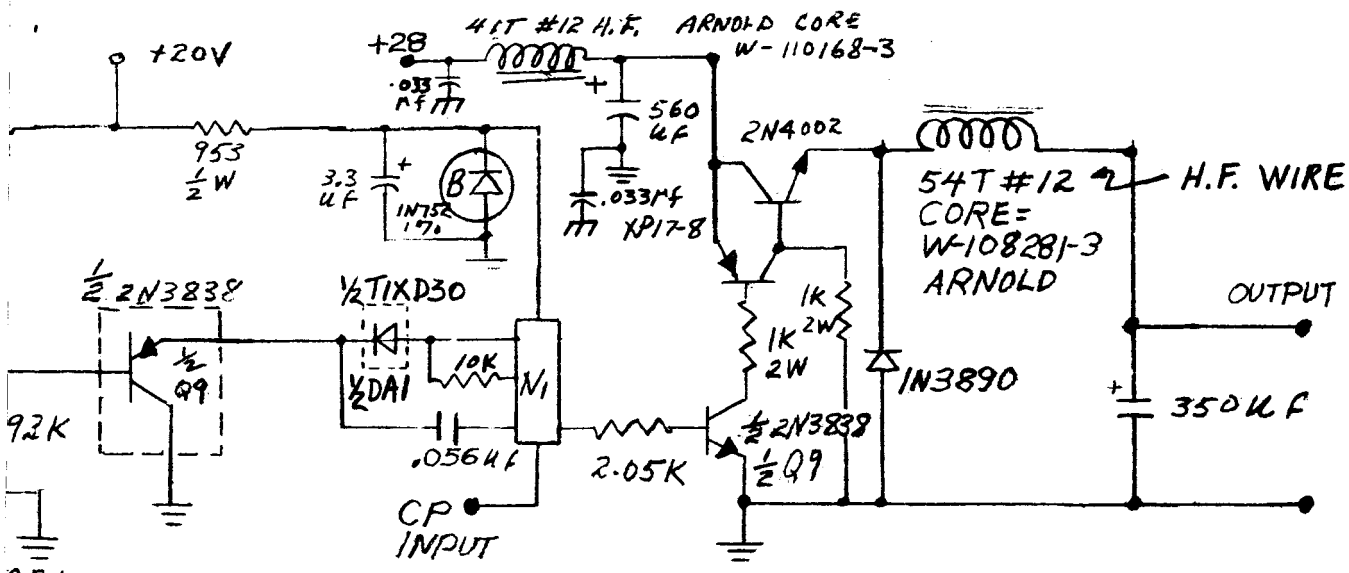
VLATOR


VOLTAGE SENSE TRANSFORMERS
½ TIXD29
½ DA2
N4
TO A
TO B
TO C
T1
T3
T2
CORES: 52176-2A
PRI: 900T #36
≈36Ω RES
SEC: 200T #34
≈6Ω RES
WIRE: H. FORMVAR
108
100
150Ω
750
1900 uF
2N3094
Q10
+7.0VDC
IN759
1%
B
4.99K
14.3K
3.01K
47.5K
402
½W
N2
220 PF
3.92K
DIFFERENTIAL AMPLIFIER
5N523A
CURRENT SENSE TRANSFORMERS
½ TIXD29
½ DA2
TO LEG C
TO LEG B
TO LEG A
CORES: MAGNETICS 51000-2A
PRI: 2T#16
SEC: 500T#32
≈6.5Ω RES.
WIRE: H. FORMVAR
150 ¼W
½ TIXD30
½ DA1
100
220 uF
200 ¼W
100 K
220PF
IN969B
CHASSIS GROUND
-28V TERMINAL



VARIABLE DUTY CYCLE ONE-SHOT (MODIFIED SN5380)

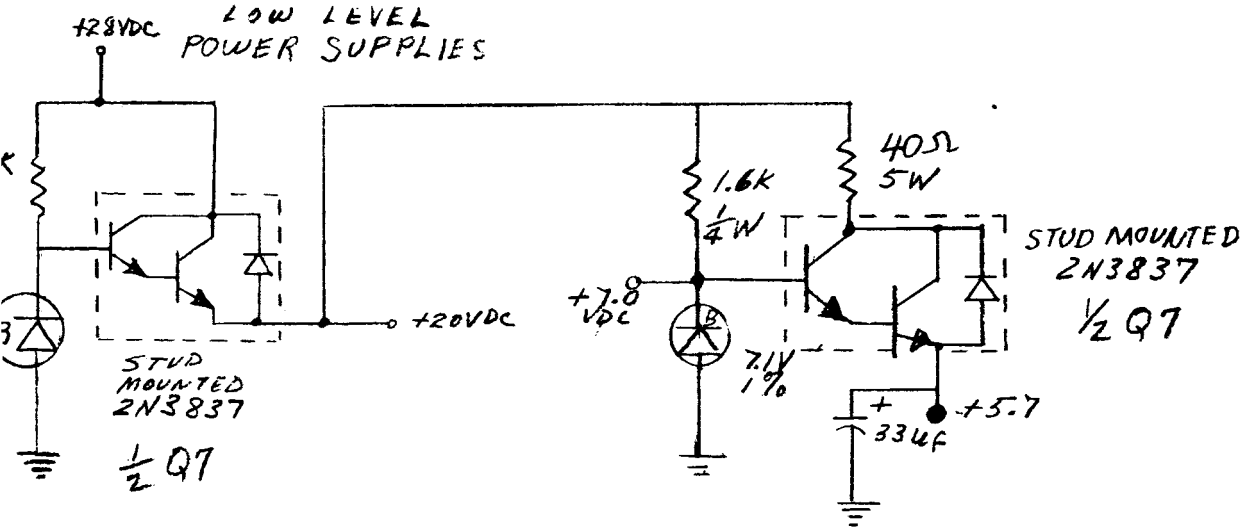


FIGURE 1B

SWITCHING REGULATOR

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